Influence of grazing or short-term grain feeding on polyunsaturated fatty acid concentrations of Australian beef

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Due to fluctuation in climatic conditions, the quality of pasture varies throughout the year under Australian feeding systems. Whilst the majority of beef and lamb are grass fed, short-term grain feeding (< 70 days) is a common practice under grazing systems, particularly in dry seasons. In previous studies, we have shown that total lipid content and functional lipid (polyunsaturated fatty acid) concentrations in lamb muscle can be significantly altered by dietary supplementation (1,2). In this study we report the influence of grazing or short-term grain feeding (3 months) prior to slaughter on functional lipid components and major fatty acid classes in Australian domestic beef cattle. Rump steaks collected from beef cattle (*Bos Taurus* and *Bos Indicus*) raised in different sites in Queensland were used in this study. In each treatment, muscle samples from 15 animals were ground, homogenized, and replicate samples were analysed for the determination of fatty acid concentrations using C23:0 as an internal standard. The effect of diets on muscle (rump) fatty acid concentration in *Bos Taurus* and *Bos Indicus* are shown below.

There was no significant diet X genotype interaction observed except for conjugated linoleic acid ($P < 0.01$) concentration. Long chain n-3 ($P < 0.001$) and conjugated linoleic ($P < 0.001$) acid concentrations (functional lipids) were significantly higher in beef raised under grazing than grain finished while 18:1-trans fatty acid ($P < 0.001$) concentration was increased by grain finishing. Beef from *Bos Taurus* had significantly greater levels of long chain n-3 ($P < 0.05$), n-6 ($P < 0.001$) fatty acids and 18:1-trans fatty acid ($P < 0.01$) compared with beef from *Bos Indicus*. Grain finishing significantly reduced muscle saturated fatty acid, monounsaturated (cis) fatty acid, n-3 polyunsaturated fatty acids (PUFA) and conjugated linoleic acid (CLA) contents compared with those of cattle raised under grazing. Results indicate that n-3 PUFA, CLA, trans-18:1, monounsaturated (cis), and saturated fatty acid levels in red meat can be affected by feeding regime. Grain-finished beef contains long chain n-3 PUFA but not as much as grass fed. The total long chain n-3 PUFA in the beef samples were similar to values found in white fish (3). The present data show that lean red meat is a useful source of long chain omega-3 fatty acids.

Gtype	*Bos Taurus*[1]		*Bos Indicus*[1]		SEM	Significance		
	Grass	Grain	Grass	Grain		Diet	Genotype	Diet X
Total saturated FA	1501[b]	1114[a]	1298[ab]	1036[a]	154	0.01	NS	NS
Total monounsaturated FA	1574[b]	953[a]	1315[b]	989[a]	158	0.001	NS	NS
Total n-3 FA	175[b]	93[a]	158[b]	75[a]	12.6	0.001	NS	NS
Total n-6 FA	316[b]	352[b]	268[a]	259[a]	26.9	NS	0.001	NS
Long-chain n-3 FA	114[b]	74[a]	105[b]	60[a]	8.3	0.001	0.05	NS
Conjugated linoleic acid	25.7[c]	9.4[a]	18.8[b]	12.5[a]	2.82	0.001	NS	0.02
18:1-trans fatty acid	66.7[a]	166[c]	52.3[a]	100[b]	15.8	0.001	0.001	NS

[1]Values are means of 15 × 2 (rump steaks) observations and given in mg/100 g of muscle sample.
[a,b,c]Superscript letters indicate significance at $P < 0.05$ between columns.

References

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